

WHAT IS CLAIMED IS:

1. A hybrid power supply apparatus interchangeable with a conventional battery removably positionable within a battery receptacle tray of an electric vehicle, the battery having a power output connectable to the drive system of the vehicle, said hybrid power apparatus comprising:
 - (a) a fuel cell;
 - (b) an energy storage device chargeable by said fuel cell;
 - (c) a housing enclosing said fuel cell and said energy storage device, wherein said housing is sized to fit within said battery receptacle tray; and
 - (d) a power output electrically connectable to said storage device and extending externally of said housing for electrically coupling said apparatus to said drive system of said vehicle when said housing is positioned within said battery receptacle tray.
2. The apparatus of claim 1, further comprising a coolant system for flowing gas through said housing, said coolant system comprising:
 - (a) a gas inlet for drawing gas into said housing;
 - (b) at least one blower positioned within said housing for moving gas through said housing in predetermined flow paths to regulate the temperature of said apparatus; and
 - (c) a gas outlet for expelling exhaust gas from said housing.
3. The apparatus of claim 2, wherein said housing comprises a user interface surface which is exposed when said housing is placed within said vehicle receptacle tray, wherein said gas inlet and gas outlet are located on said user interface surface.

4. The apparatus of claim 3, wherein the temperature of said exhaust gas does not exceed 50 °C when said coolant system is in operation.
- 5 5. The apparatus of claim 3, wherein said coolant system maintains said user interface surface at a temperature not exceeding 50 °C when said apparatus is in operation.
6. The apparatus of claim 2, wherein said energy storage device
10 is located within said housing proximate said gas inlet.
7. The apparatus of claim 1, further comprising a fuel processor positioned within said housing for converting a source of fuel to hydrogen-enriched gas for delivery to said fuel cell.
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8. The apparatus of claim 7, further comprising a fuel storage chamber located within said housing, wherein said storage chamber is in fluid communication with said fuel processor.
- 20 9. The apparatus of claim 8, further comprising a fuel inlet on said housing in fluid communication with said fuel storage chamber.
- 10 The apparatus of claim 9, wherein said housing comprises a user interface surface which is exposed when said housing is placed within
25 said vehicle receptacle tray, wherein said fuel inlet is located on said user interface surface.
11. The apparatus of claim 8, wherein said fuel chamber is thermally isolated from the remainder of said housing.
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12. The apparatus of claim 1, further comprising a fuel storage chamber located within said housing, wherein said storage chamber is in fluid communication with said fuel cell.

13. The apparatus of claim 8, wherein said fuel storage chamber stores methanol fuel.
14. The apparatus of claim 8, wherein said fuel storage chamber stores propane fuel.
15. The apparatus of claim 1, further comprising a controller positioned within said housing for regulating operation of said fuel cell depending upon the state of charge of said energy storage device.
16. The apparatus of claim 1, wherein said energy storage device comprises at least one battery.
17. The apparatus of claim 1, wherein said energy storage device comprises at least one capacitor.
18. The apparatus of claim 1, further comprising a DC/DC power converter positioned within said housing for converting DC current generated by said fuel cell to a voltage suitable for charging said energy storage device.
19. The apparatus of claim 1, further comprising a load compensator positioned within said housing for increasing the weight of said apparatus to a weight approximating the weight of said conventional battery.
20. The apparatus of claim 1, further comprising a first vibration dampener positioned within said housing for absorbing vibration when said vehicle is in operation.
21. The apparatus of claim 20, comprising a second vibration dampener which surrounds at least part of said housing when said housing is positioned within said battery receptacle tray.

22. The apparatus of claim 1, wherein said housing is sized to fit within a pallet truck battery receptacle tray having the following dimensions: 31" L X 13"W X 32"H.

5 23. The apparatus of claim 1, wherein said housing is sized to fit within a narrow aisle lift truck battery receptacle tray having the following dimensions: 38" L X 20"W X 31"H.

24. The apparatus of claim 1, wherein said housing is sized to fit
10 within a sit-down lift truck battery receptacle tray having the following dimensions: 38" L X 32"W X 22"H.

25. A method of converting an electric vehicle having a high peak
15 power to average power ratio to hybrid power, the vehicle having a conventional battery removably positionable within a battery receptacle tray of the vehicle and electrically connectable to a drive system of the vehicle, said method comprising;

20 (a) providing a hybrid power supply apparatus as defined in claim 1;

(b) removing said conventional battery from said battery receptacle tray;

25 (c) positioning said housing of said hybrid power apparatus within said battery receptacle tray; and

(d) electrically connecting said power output of said hybrid
30 power apparatus to said drive system of said vehicle.

26. A stand-alone hybrid power supply apparatus comprising:

(a) a fuel cell;

(b) an energy storage device chargeable by said fuel cell;

- (c) a housing enclosing said fuel cell and said energy storage device within a self-contained space; and
- (d) a power output on an external surface of said housing for electrically connecting said apparatus to a load, wherein said output is the sole interface between said apparatus and said load.

27. The apparatus of claim 26, wherein said housing has a size not exceeding 38" L X 32"W X 31"H.

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28. A hybrid power apparatus for use in a battery-operated vehicle provided with an electrical receptacle and a battery receptacle tray, the hybrid power apparatus comprising;

15 (a) a hybrid fuel cell subsystem including a fuel reformer, fuel cell, DC power converter, microcontroller and energy storage device;

20 (b) a housing containing said hybrid fuel cell subsystem and having dimensions less than said battery receptacle tray such that said housing is movable within said tray;

25 (c) an external DC interface attached to said housing and electrically connected to said hybrid fuel cell subsystem and including a plug interface suitable to mate to said vehicle electrical receptacle; and

30 (d) gas inlet and outlet interfaces mounted on at least one uncovered surface of said housing when said housing is placed within said tray, wherein said interfaces are connected to said hybrid fuel cell subsystem and include circulation fans and valves connected to and controlled by said microcontroller of said hybrid fuel cell subsystem.